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BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Chile

UNITED STATES DEPARTMENT OF THE INTERIOR

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The Mineral Industry of Chile

By Pablo Velasco[1]

Preliminary data by the Central Bank of Chile indicated that production of copper in the nation set another record high of more than 1.4 million tons in 1987, representing a slight increase over that of 1986 and firmly placing Chile as the world's leading producer and exporter of copper. The growth of Chile's copper industry stems from the high grade of the ore deposits and low production costs.

Income earned from the mining sector's exports amounted to $2.9 billion[2] in 1987, an increase of 26% and representing approximately 58% of the total exports. Copper accounted for $2.2 billion; silver and gold, $304 million. Chile also maintained its rank in the world as the largest producer and exporter of natural crude nitrates (sodium and potassium) and rhenium, 2d in iodine and molybdenum, 3d in lithium, 8th in silver, and 11th in gold. The improvement in mineral prices in the international market, in particular the recovery of world copper prices after a prolonged period of stagnation, had contributed more than $250 million to the value of exports.

Crude petroleum output declined in 1987 because of oilfield depletion in the Strait of Magellan. Domestic oil production supplied about 40% of national consumption. Coal production increased in 1987, reflecting increased demand for steam coal to substitute for fuel oil in thermoelectrical generating plants and the startup of operations at the Cia. de Carbones de Chile Ltda. (COCAR) coal deposit in southern Chile.

The Chilean economy completed its fifth year of economic expansion, well past the recovery phase. The gross domestic product (GDP) grew at a 5.4% rate during 1987, less than the 5.7% rate in 1986, to just above $18.4 billion in terms of current prices. Construction, fishing, transportation, and retail trade accounted for the bulk of the growth. The mining industry was stagnant in 1987 following a 1.5% growth in 1986. Chile was less vulnerable to fluctuations of the world price of copper, traditionally its main export, because of it is less dependent on copper exports. In 1987, copper exports accounted for just 42% of Chile's foreign exchange earnings compared with a 82% share in 1973.

In December 1987, the U.S. Government suspended Chile from eligibility for duty-free entry under the Generalized System of Preferences (GSP) because of Chile's inadequate protection for workers' rights.

The major development in Chile's balance-of-payments outlook in 1987 was the renegotiation in March and April of all medium- and long-term debt to private and foreign government lenders.

The Chilean Government followed cautious monetary and fiscal policies, as required by the economic programs of the International Bank for Reconstruction and Development (World Bank) and the International Monetary Fund. The rate of inflation rose from 17% in 1986 to 22% in 1987.

Government Policies and Programs.—Chile is considered to have an attractive foreign investment law, with liberal capital transfer rules. Of the $1.17 billion in foreign investments that entered the country in 1987, about $497 million corresponded to transactions carried out under Decree Law 600, Chile's foreign investment statute. The remaining $674 million was the result of debt-equity swap operations under chapter XIX of the Central Bank's foreign exchange regulations. In 1986, foreign investments under Decree Law 600 amounted to $184 million, while those under chapter XIX

added $903 million. U.S. firms have been the leaders in taking advantage of Chile's debt-equity swap program. U.S. corporations have bought into Chilean firms to improve their market position in Chile or to convert loans into equity.

Among the most significant projects that materialized in 1987 were the construction of Cape Horn Methanol Ltd.'s $330 million facility near Punta Arenas on the Strait of Magellan, and AMAX Inc.'s formal commitment to invest $300 million in a project in northern Chile that will produce potassium chloride, potassium sulfate, boric acid, and lithium carbonate. Other large approved investments in 1987 were the $400 million ammonia-urea plant in southern Chile and an $8 million contract for petroleum exploration in the Salar de Atacama.

Japan, an important source of investments in Chile, reported through its foreign trade organization that from January 1985 to June 1987, Japanese companies invested $650 million through debt-equity swap transactions. Cominco Resources International Ltd. of Canada and Anglo American Corp. of the Republic of South Africa received approval from their respective boards of directors to begin construction of the Marte gold mine in north-central Chile in early 1988.

The Minister of Mines announced the go-ahead on the La Escondida Mine investment and the funding of major new gold mines. The minister projected that copper output would rise to 2 million tons per year by 1992, when the $1.1 billion Escondida Mine is on-stream and when the current $1.25 billion investment program of the Corporación del Cobre de Chile (CODELCO-Chile) is completed. Also by 1992, gold production in Chile would double, and silver output was expected to increase to about 26 million troy ounces per year.

Privatization of some state enterprises continued throughout the year with sales to private and institutional investors. Companies held by the Corporación de Fomento de la Producción (CORFO) sold shares to their employees.

PRODUCTION

The 16 leading minerals produced in Chile during 1987 were coal, copper, gold, iodine, iron ore, lead, lithium carbonate, manganese, molybdenum, sodium and potassium nitrates, natural gas, crude oil, petroleum products, silver, sodium sulfate, and zinc. Output of eight of these minerals was lower while production rose for the other eight. The production of fine copper increased slightly to 1.41 million tons, more than in 1986, as a result of the mining of higher grades of ore deposits and in response to the recovery of world copper prices. Output of copper's principal byproduct, molybdenum, reached almost 17,000 tons of concentrate, of which 6,200 tons was converted into molybdenum trioxide. The remainder was processed into ferromolybdenum alloy and ammonium perrhenate at Chile's Molibdenos y Metales S.A. (Molymet) plant near Santiago.

CODELCO-Chile accounted for 77% of the country's total copper output and all of the output of molybdenum, which was marketed mainly as a concentrate of molybdenum trioxide. The small- and medium-scale mining sector produced the remaining 23% of the copper.

Among other important mineral commodities, total gold output decreased 5.0% because of decreased output from St. Joe Mineral Co.'s El Indio Mine. State-owned Empresa Nacional de Minería (ENAMI) increased its output of gold almost 12%, while CODELCO-Chile's output was 3.5% lower. Silver production decreased slightly to 16.0 million ounces. Domestic crude oil and natural gas outputs decreased, while production of run-of-mine coal increased by more than 19% owing to increases in demand for fuel oil substitutions in thermoelectrical plants. Production of industrial minerals was higher with the exception of borates, feldspar, sodium and potassium nitrates, and talc.

Table 1.—Chile: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1983	1984	1985	1986[p]	1987[e]
METALS					
Arsenic trioxide[e]	--	3,500	4,000	[r]4,000	5,029
Copper:					
Mine output, Cu content[3]	1,255,374	1,307,503	1,359,840	1,399,384	1,412,936
Metal:					
Smelter, primary[4]	1,058,900	1,098,300	1,088,500	1,124,100	[e]1,099,100
Refined:[5]					
Fire, primary refined	[r]153,800	[r]183,090	180,900	185,300	[e]187,900
Electrolytic	[r]680,400	[r]696,700	703,400	757,200	[e]767,600
Total	834,200	879,700	884,300	942,500	[e]955,500
Gold, mine output, Au content troy ounces	570,964	541,064	554,278	576,719	547,678
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	5,809	6,685	6,534	7,009	6,690
Fe content do	3,489	3,991	3,967	4,197	4,078
Metal:					
Pig iron do	540	594	580	591	617
Ferroalloys:					
Ferromanganese	5,209	4,890	6,330	6,277	6,613
Ferrosilicomanganese	--	--	755	1,706	1,231
Ferrosilicon	4,885	6,365	4,501	3,732	4,258
Ferromolybdenum	1,712	2,211	671	1,397	860
Other	--	--	--	--	502
Total	11,806	13,466	12,257	13,112	13,464
Steel, crude[e] thousand tons	618	692	689	706	720
Semimanufactures (hot-rolled) do	371	473	442	481	545
Lead, mine output, Pb content	1,679	4,284	2,473	1,501	829
Manganese ore and concentrate:					
Gross weight	26,050	[r]26,807	35,631	31,631	31,803
Mn content	4,485	[r]8,680	11,865	11,097	10,823
Molybdenum, mine output, Mo content	15,264	16,861	18,389	16,581	16,941
Rhenium, mine output, Re content pounds	12,516	14,198	12,266	18,609	14,471
Selenium kilograms	43,869	25,450	50,037	47,000	45,909
Silver thousand troy ounces	15,058	15,766	16,633	16,078	16,068
Zinc, mine output, Zn content	5,993	19,168	22,288	10,504	19,618
INDUSTRIAL MINERALS					
Barite	114,595	21,722	54,494	53,121	52,109
Borates, crude, natural (ulexite)	1,301	3,985	4,773	6,440	13,438
Cement, hydraulic thousand tons	1,255	1,390	1,430	1,440	1,594
Calcite[e] do	--	--	--	2,757	2,972
Clays:					
Kaolin	40,812	48,608	48,537	42,170	44,533
Other (unspecified)	31,876	36,543	9,177	14,435	15,975
Diatomite	741	1,712	2,317	2,684	3,218
Feldspar	2,356	3,026	2,565	2,275	705
Gypsum:					
Crude	66,337	167,477	195,911	192,848	235,173
Calcined	53,425	44,818	57,222	60,452	92,441
Iodine, elemental	2,793	[r]2,661	3,020	3,076	3,101
Lapis lazuli kilograms	--	9,000	8,500	[e]8,000	--
Lime, hydraulic[e] thousand tons	723	778	800	800	750
Lithium carbonate	--	2,110	4,508	4,458	6,139
Nitrogen: Natural crude nitrates:					
Sodium	472,710	595,360	621,330	617,010	556,240
Potassium	149,800	132,100	150,000	147,100	165,070
Total	622,510	727,460	771,330	764,110	721,310
Phosphates:					
Guano	129	NA	3,150	7,546	5,605
Rock	935	4,606	7,110	6,684	10,389
Total	1,064	4,606	10,260	14,230	15,994
Pigments, mineral, natural: Iron oxide	6,751	16,113	8,224	4,404	8,145
Potash, K_2O equivalent	21,280	18,494	21,000	20,000	[e]20,000
Pumice (includes pozzolan)	173,789	172,150	206,333	222,080	242,453
Quartz, common	221,757	293,465	287,510	293,218	350,488
Salt, all types	714,598	625,760	753,427	1,032,373	865,168
Sodium compounds, n.e.s.: Sulfate[7]	51,300	56,770	52,700	58,700	60,406
Stone:					
Limestone thousand tons	2,142	2,326	2,470	2,757	3,017
Marble	--	1,440	1,300	--	--

See footnotes at end of table

Table 1.—Chile: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1983	1984	1985	1986[p]	1987[e]
INDUSTRIAL MINERALS —Continued					
Sulfur:					
Native, other than Frasch:					
Refined	15,688	13,685	14,755	13,297	14,917
Caliche	83,060	40,279	63,992	43,826	22,131
Byproduct (from industrial gases)	32,364	32,135	30,073	41,142	334,100
Total	131,112	86,099	108,820	98,265	371,148
Talc	637	422	1,299	2,257	980
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous and lignite thousand tons	1,095	1,323	1,384	1,454	1,736
Coke: Coke oven do.	279	278	291	294	297
Gas, natural:					
Gross million cubic feet	169,609	[r]172,971	163,790	153,866	153,725
Marketed do.	52,760	53,431	50,535	42,342	40,448
Natural gas liquids:					
Natural gasoline:					
thousand 42-gallon barrels	937	962	945	893	895
Liquefied petroleum gas do.	2,855	[r]2,956	2,916	2,716	2,760
Total do.	3,792	[r]3,918	3,861	3,609	3,655
Petroleum:					
Crude do.	14,365	14,069	13,048	12,204	10,922
Refinery products:					
Gasoline:					
Aviation					
thousand 42-gallon barrels	94	56	25	82	51
Motor do.	8,032	8,233	8,246	7,793	9,000
Jet fuel do.	1,126	[r]1,264	1,195	1,372	1,617
Kerosene do.	1,164	[r]855	755	969	1,069
Distillate fuel oil do.	7,394	8,064	8,749	9,661	10,611
Residual fuel oil do.	6,390	5,982	5,566	5,642	5,466
Liquefied petroleum gas do.	2,208	5,114	4,831	5,044	5,334
Unspecified do.	1,252	1,453	1,554	1,566	1,377
Total do.	27,600	31,021	30,921	32,129	34,525

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 1988.

[2]In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output levels.

[3]Figures are the nonduplicate copper content of ore, concentrates, cemented copper, slags and minerals, copper as a byproduct of gold and silver precipitate, and other copper-bearing products measured at the last stage of processing as reported in available sources.

[4]Figures are total blister, fire-refined, electrolytic, and equivalent copper output including that blister subsequently refined in Chile and copper produced by electrowinning. Detailed statistics on electrowinning are not available; although based on current plant capacities, electrowon copper production is estimated to be approximately 55 metric tons per year.

[5]Figures are total refined copper distributed into two classes according to method of refining, fire-refined and electrolytic, which includes electrowon copper refined in Chile.

[6]Excludes castings.

[7]Includes natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry.

TRADE

The total value of mineral exports in 1987 was $2.9 billion, 26% higher than in 1986. Minerals represented approximately 58% of the country's total exports: copper, $2.2 billion; gold and silver, $304 million; iron ore, $101 million; molybdenum, $100 million; nitrates and iodine, $99 million; and other mineral products, $89 million. Improved copper prices accounted for $330 million of the value of exports. For the year as a whole, the average price of copper rose to 81 cents per pound, peaking at an average for December of $1.30 per pound. World prices for iodine also rose significantly. As the world's largest producer of primary copper, Chile supplied the world metal market with approximately 1.2 million tons of fine copper contained in a number of products. The amount represents nearly 15% of Western World copper consumption.

Of the total copper exported, 1.09 million tons was produced by CODELCO-Chile, and the remainder was sold by private companies. Of the copper exported, 55% was electrolytic copper in the form of wirebars and cathodes; 14% was fire-refined copper;

15% was blister copper, and the remaining 16% was copper contained in concentrates. Earnings from copper exports totaled $1.9 billion, about $460 million more than in 1986.

CODELCO-Chile shipments of molybdenum in 1987 amounted to about 18,000 tons of contained molybdenum for a value of $120 million. This compares with shipments of 19,408 tons of contained molybdenum valued at $125 million in 1986. Shipments by CODELCO-Chile of other byproducts were valued at $87 million, an increase of $46 million compared with those of 1986.

Table 2.—Chile: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	Destinations, 1986	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	57	147	--	All to Japan.
Semimanufactures	17	22	--	Bolivia 11; Uruguay 5; Ecuador 3.
Copper:[2]				
Ore and concentrate thousand tons	6,124	20,796	25	Brazil 9,352; Japan 5,970; Canada 2,017.
Matte and speiss including cement copper	420	--		
Metal including alloys:				
Scrap	187,206	206,029	28,691	Turkey 27,867; West Germany 22,173.
Unwrought	894,339	924,979	161,519	West Germany 138,303; Italy 112,210.
Semimanufactures	11,725	14,096	2,833	Colombia 6,433; Ecuador 1,419.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	6,092	4,666	108	Japan 4,506; Mexico 52.
Pyrite, roasted value, thousands	--	$1	--	All to France.
Metal:				
Scrap	2,502	17,013	--	Peru 5,455; Bolivia 360; unspecified 11,198.
Ferroalloys:				
Ferromanganese	404	220	--	Peru 100; Ecuador 80; Colombia 40.
Unspecified	3,272	5,243	902	Belgium-Luxembourg 1,542; Peru 890.
Steel, primary forms	79,174	88,594	24	Ecuador 43,754; Costa Rica 31,692; Guatemala 11,512.
Semimanufactures:				
Bars, rods, angles, shapes, sections	11,052	11,679	--	El Salvador 5,044; Ecuador 3,906; Honduras 1,558.
Universals, plates, sheets	14,577	23,063	--	Costa Rica 7,944; Ecuador 6,460; Guatemala 5,743.
Hoop and strip	7	32	--	Peru 31; Iraq 1.
Wire	800	726	535	Peru 143; Bolivia 35.
Tubes, pipes, fittings	265	49	16	Iraq 24; Bolivia 7.
Castings and forgings, rough	18	71	7	Panama 42; Dominican Republic 20.
Lead:				
Ore and concentrate	2,266	3,132	1,984	Belgium-Luxembourg 1,148.
Metal including alloys, semimanufactures	16	--		
Molybdenum: Ore and concentrate, Mo content	5,523	6,115	--	Netherlands 2,915; Canada 1,294; West Germany 881.
Nickel: Matte and speiss	11	3	--	All to West Germany.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, platinum value, thousands	$27	$290	$258	United Kingdom $32.
Silver:				
Ore and concentrate[3] do.	$56,677	$84,304	--	Japan $43,090; Sweden $15,697; West Germany $15,282.
Waste and sweepings[3] do.	$18	$61	--	Belgium-Luxembourg $33; United Kingdom $28.
Metal including alloys, unwrought and partly wrought	$67,200	$68,214	$33,726	West Germany $10,154; United Kingdom $8,784.
Zinc:				
Ore and concentrate	36,809	43,322	--	Japan 24,648; Republic of Korea 7,449; Belgium-Luxembourg 6,131.
Metal including alloys:				
Scrap	45	(4)	--	All to Iraq.
Semimanufactures	--	1	--	All to Guatemala.

See footnotes at end of table.

Table 2.—Chile: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1985	1986	Destinations, 1986	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	34,871	29,246	1,964	United Kingdom 9,636; Japan 4,956; Netherlands 3,325.
Ashes and residues	3	7,180	5	Belgium-Luxembourg 7,175.
Base metals including alloys, all forms	4	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial corundum	10	--		
Grinding and polishing wheels and stones	--	1	NA	NA.
Asbestos, crude	--	20	--	All to Uruguay.
Barite and witherite	68,828	26,843	26,843	
Boron materials: Crude natural borates	--	4,743	4,493	Brazil 200; Colombia 50.
Cement	--	2,750	--	All to New Caledonia.
Chalk	--	30	--	Bolivia 20; Argentina 10.
Diamond: Gem, not set or strung value, thousands	$13	$14	$6	West Germany $3; Thailand $2.
Diatomite and other infusorial earth	432	614	--	Argentina 560; Peru 29; Brazil 19.
Fertilizer materials:				
Crude, n.e.s	--	165	--	West Germany 100; Bolivia 60; unspecified 5.
Manufactured:				
Ammonia	--	1	--	All to Peru.
Nitrogenous	4,393	4,501	--	Colombia 2,950; Argentina 1,125; Bolivia 211.
Phosphatic	--	54	--	Argentina 50; Bolivia 4.
Unspecified and mixed	113,210	108,315	18,375	Brazil 77,985; Belgium-Luxembourg 3,530.
Gypsum and plaster	--	33	--	All to New Caledonia.
Nitrates, crude	327,011	361,909	96,009	Belgium-Luxembourg 103,357; China 88,466.
Phosphates, crude	10	84	--	All to Ecuador.
Pigments, mineral: Iron oxides and hydroxides, processed	--	20	--	Do.
Precious and semiprecious stones other than diamond, natural value, thousands	$13	$5	--	All to Spain.
Salt and brine	517,117	921,244	488,962	Brazil 256,909; Canada 109,277.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	--	115	--	Bolivia 104; Peru 6; Paraguay 5.
Sulfate, manufactured	40,064	31,421	20	Brazil 15,277; New Zealand 5,200; Venezuela 3,950.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	18	--		
Worked	--	45	43	Argentina 2.
Quartz and quartzite	94	(4)	--	All to West Germany.
Sulfuric acid	15	15	--	All to Bolivia.
Other:				
Crude	--	160	--	Uruguay 110; Brazil 50.
Slag and dross, not metal-bearing	--	96,534	--	All to Japan.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	16	--	Bolivia 10; Ecuador 6.
Coal:				
Lignite including briquets	--	3	--	All to Bolivia.
All grades excluding briquets	--	140	--	Do.
Coke and semicoke	34,362	12,229	--	All to Belgium-Luxembourg.
Petroleum:				
Crude 42-gallon barrels	--	202	--	Argentina 194; Ecuador 8.
Refinery products:				
Mineral jelly and wax do.	8	150	--	All to Spain.
Kerosene and jet fuel do.	271,157	5,634	--	Panama 5,247; Bolivia 387.
Distillate fuel oil do.	3,119	1,641	--	United Kingdom 276; unspecified 1,365.
Lubricants do.	12,096	104,237	--	Peru 86,547; Uruguay 17,136; Paraguay 945.
Nonlubricating oils do.	112	49	--	Uruguay 28; Bolivia 21.
Residual fuel oil do.	393	3,117	--	United Kingdom 1,039; unspecified 2,078.
Petroleum coke do.	55	270	--	All to Bolivia.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Previously reported copper data were from separate sources using different reporting techniques.
[3]May include other precious metals.
[4]Less than 1/2 unit.

Table 3.—Chile: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	Sources, 1986	
			United States	Other (principal)
METALS				
Alkali and rare-earth metals	19	43	(2)	China 23; Algeria 5; U.S.S.R. 5.
Aluminum:				
Ore and concentrate	2,469	2,251	--	Mainly from Guyana.
Oxides and hydroxides	532	471	323	Japan 59; Netherlands 40.
Metal including alloys:				
Scrap	1,948	3,420	6	Venezuela 1,493; Canada 1,041; Argentina 738.
Unwrought	--	20	20	
Semimanufactures	2,499	2,813	359	Brazil 892; West Germany 885.
Chromium:				
Ore and concentrate	4,506	4,490	--	Turkey 2,090; New Caledonia 1,482; Republic of South Africa 551.
Oxides and hydroxides	103	107	7	Brazil 47; West Germany 28; Argentina 13.
Cobalt: Oxides and hydroxides	30	9	7	Belgium-Luxembourg 2.
Columbium and tantalum: Metal including alloys, all forms, tantalum value, thousands	$17	--		
Copper:				
Ore and concentrate	17	--		
Metal including alloys:				
Scrap value, thousands	$55	--		
Unwrought	6	7	3	United Kingdom 4.
Semimanufactures	271	504	78	Brazil 198; Republic of Korea 87.
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted	17	10	5	Japan 5.
Metal:				
Scrap	5,200	81	18	Republic of South Africa 61; West Germany 2.
Pig iron, cast iron, related materials	1,391	500	23	West Germany 329; Brazil 120; Argentina 25.
Ferroalloys:				
Ferromanganese	436	627	1	Brazil 346; France 120; Republic of South Africa 75.
Unspecified	1,795	1,482	55	Republic of South Africa 841; West Germany 291; Sweden 158.
Steel, primary forms	15,670	35,727	993	Republic of South Africa 14,597; Brazil 6,020; West Germany 3,966.
Semimanufactures:				
Bars, rods, angles, shapes, sections	61,641	87,806	225	Argentina 33,166; Republic of South Africa 12,425; Brazil 12,224.
Universals, plates, sheets	19,879	39,757	97	Brazil 9,279; Japan 8,183; United Kingdom 8,101.
Hoop and strip	1,709	1,944	36	Brazil 797; United Kingdom 482; West Germany 433.
Rails and accessories	2,775	4,038	2,647	United Kingdom 530; Republic of South Africa 352.
Wire	1,430	1,686	31	Brazil 637; Japan 467; Republic of South Africa 155.
Tubes, pipes, fittings	5,202	6,565	533	Brazil 1,907; Japan 1,196; West Germany 614.
Castings and forgings, rough	4,289	5,253	871	Belgium-Luxembourg 1,791; Brazil 908.
Lead:				
Oxides	182	157	2	Peru 104; Republic of South Africa 51.
Metal including alloys:				
Scrap	1,232	1,541	71	Peru 1,267; Mexico 150.
Unwrought	236	55	55	
Semimanufactures	16	220	6	United Kingdom 121; West Germany 88.
Magnesium: Metal including alloys:				
Unwrought	--	1	1	
Semimanufactures	23	5	2	West Germany 3.
Manganese: Oxides	39	56	33	Belgium-Luxembourg 13; Netherlands 10.

See footnotes at end of table.

Table 3.—Chile: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1985	1986	Sources, 1986	
			United States	Other (principal)
METALS —Continued				
Molybdenum: Metal including alloys, all forms ..... value, thousands	$20	$34	--	Austria $19; Belgium-Luxembourg $13; United Kingdom $2.
Nickel:				
Matte and speiss	75	307	10	Canada 173; U.S.S.R. 68; Norway 37.
Metal including alloys, semimanufactures	64	92	11	Austria 32; Netherlands 20.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, platinum ..... value, thousands	$13	$36	$14	West Germany $19; Switzerland $3.
Silver:				
Ore and concentrate[2] ..... do	--	$5	--	All from Greece.
Metal including alloys, unwrought and partly wrought ..... do	$95	$131	$21	West Germany $73; Italy $15.
Tin:				
Ore and concentrate	8	--		
Metal including alloys:				
Scrap	296	333	12	Bolivia 149; Malaysia 72; United Kingdom 54.
Semimanufactures	5	14	(3)	Bolivia 8; United Kingdom 2; Brazil 1.
Titanium: Oxides	301	402	7	United Kingdom 342; Belgium-Luxembourg 29; Republic of South Africa 10.
Tungsten: Metal including alloys, all forms ..... value, thousands	$22	$20	$17	Brazil $1; Japan $1.
Uranium and thorium: Metal including alloys, all forms ..... do	$91	$85	$8	West Germany $20; Sweden $17; Bolivia $16.
Zinc:				
Oxides	149	156	--	Peru 66; Argentina 55; Netherlands 23.
Metal including alloys:				
Scrap	5,963	5,630	--	Peru 4,710; Canada 400; Netherlands 300.
Unwrought	73	4131	--	Peru 127; Belgium-Luxembourg 4.
Semimanufactures	170	198	3	United Kingdom 94; Belgium-Luxembourg 31; Republic of South Africa 28.
Other:				
Ores and concentrates	209	5,222	--	United Kingdom 5,000; Republic of South Africa 139; Australia 82.
Oxides and hydroxides	17	15	9	West Germany 5.
Base metals including alloys, all forms	45	112	2	Republic of South Africa 50; United Kingdom 42; Netherlands 11.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	73	79	29	West Germany 48.
Artificial corundum	994	1,250	6	United Kingdom 720; West Germany 349; Brazil 110.
Dust and powder of precious and semiprecious stones ..... value, thousands	$13	$19	$14	Spain $4; West Germany $1.
Grinding and polishing wheels and stones	470	646	12	Brazil 210; West Germany 139; Switzerland 107.
Asbestos, crude	8,387	38,915	409	Canada 38,026; Italy 271.
Barite and witherite	1	8	--	All from Peru.
Boron materials:				
Crude natural borates	290	--		
Oxides and acids	15	21	2	West Germany 12; France 6.
Cement	4,437	8,229	1	Argentina 5,971; France 903; Brazil 686.
Chalk	70	163	160	Brazil 3.
Clays, crude	533,414	14,419	9,821	Peru 2,570; Argentina 1,811.

See footnotes at end of table.

Table 3.—Chile: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1985	1986	Sources, 1986	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Diamond:				
Gem, not set or strung value, thousands	$16	$1	--	All from Brazil.
Industrial stones do.	$409	$323	$286	Republic of South Africa $42; Italy $1.
Diatomite and other infusorial earth	70	53	--	All from Mexico.
Feldspar, fluorspar, related materials	21,291	290	--	Republic of South Africa 197; Argentina 73; United Kingdom 20.
Fertilizer materials: Manufactured:				
Ammonia	17,853	23,913	1	Venezuela 23,909; West Germany 3.
Nitrogenous	106,593	163,091	125,968	Venezuela 33,045; Netherlands 1,961.
Phosphatic	141,426	132,097	132,096	Canada 1.
Potassic	19,900	26,377	26,369	Canada 7; West Germany 1.
Unspecified and mixed	62,691	67,126	66,559	Netherlands 393; United Kingdom 62.
Graphite, natural	4,049	166	3	Canada 100; Peru 36; West Germany 16.
Gypsum and plaster	--	2	--	Argentina 1; France 1.
Lime	3,866	6,790	--	All from Argentina.
Magnesite, crude	59,461	37,285	30,676	Brazil 3,311; United Kingdom 2,013.
Mica:				
Crude including splittings and waste	2,751	50	16	Argentina 17, India 17.
Worked including agglomerated splittings	5	6	1	India 2; Spain 1.
Nitrates, crude	2,667	80	--	All from Venezuela.
Phosphates, crude	18,948	13,971	13,971	
Pigments, mineral: Iron oxides and hydroxides, processed	107	122	3	West Germany 63; Brazil 54.
Potassium salts, crude	99,329	53,596	--	Canada 58,494; West Germany 12.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$2	$5	--	Switzerland $3; Belgium-Luxembourg $2.
Synthetic do.	$9	$7	$7	
Pyrite, unroasted	--	5	--	Switzerland 4; West Germany 1.
Salt and brine	2,088	3,256	41	West Germany 3,061; Netherlands 130.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	47,736	57,496	42,972	France 11,224; Kenya 1,998.
Sulfate, manufactured	231	359	25	Argentina 142; West Germany 97; Mexico 56.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	394	221	1	Italy 212; Bolivia 7.
Worked	402	278	9	Spain 155; Italy 58; West Germany 31.
Dolomite, chiefly refractory-grade	14,776	17,625	17,067	Argentina 473; Spain 70.
Gravel and crushed rock value, thousands	$1	--	--	
Quartz and quartzite	--	251	--	Spain 162; Brazil 66; Netherlands 13.
Sand other than metal-bearing	314	29,332	569	Argentina 24,740; Italy 18.
Sulfur:				
Elemental:				
Crude including native and by-product	77,338	65,121	3,916	Canada 41,392; Bolivia 19,783.
Colloidal, precipitated, sublimed	119	62	62	
Sulfuric acid	18,272	35,705	7	Peru 34,515; West Germany 7.
Talc, steatite, soapstone, pyrophyllite	1,380	11,044	527	Finland 10,000; Italy 248.
Other:				
Crude	5,111	1,111	718	Mexico 125; United Kingdom 93.
Slag and dross, not metal-bearing	59	109	25	United Kingdom 84.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	670	815	15	Argentina 500; Trinidad and Tobago 300.
Carbon black	5,273	5,067	382	Venezuela 3,393; Colombia 975.

See footnotes at end of table.

Table 3.—Chile: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1985	1986	Sources, 1986	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal:				
Lignite including briquets	1,049	2	2	
All grades excluding briquets	370,950	487,616	105,515	Australia 232,640; Canada 148,347.
Coke and semicoke	58,902	56,482	--	All from Japan.
Peat including briquets and litter	20	13	--	Canada 10; Ireland 2.
Petroleum:				
Crude... thousand 42-gallon barrels	15,107	19,859	3	Venezuela 6,998; Nigeria 5,335; Ecuador 2,741.
Refinery products:				
Liquefied petroleum gas do.	(2)	149	(2)	Mainly from Venezuela.
Gasoline, motor do.	100	1,004	101	Netherlands Antilles 868; Panama 34.
Mineral jelly and wax do.	53	69	2	Brazil 24; Argentina 22; West Germany 10.
Kerosene and jet fuel do.	38	122	(2)	Netherlands Antilles 118; Argentina 4.
Distillate fuel oil do.	336	1,306	297	Netherlands Antilles 1,272; Panama 27.
Lubricants do.	447	491	181	Venezuela 127; Netherlands 110.
Nonlubricating oils do.	16	12	7	Venezuela 2; United Kingdom 1.
Residual fuel oil do.	129	159	--	Panama 75; Netherlands Antilles 52; Peru 31.
Bitumen and other residues do.	31	31	2	Argentina 29.
Bituminous mixtures 42-gallon barrels	1,048	545	339	West Germany 188; Brazil 18.
Petroleum coke do.	1,111	644	88	Argentina 550; Brazil 6.

[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

METALS

Copper.—Chile continued as the leading producer and exporter of copper in the world. Copper earned more than 42% of Chile's total export revenues and remained the principal export commodity. Chile produces about 22% of the copper produced by the market economy countries. Chilean copper producers have low production costs resulting from relatively high ore grades and economies of scale, as well as lower labor and environmental control costs. Proven and probable reserves are in excess of 100 million tons of contained copper. In 1987, export shipments of copper declined slightly to 1.36 million tons. Nevertheless, copper revenues jumped 27% to $2.23 billion, reflecting the rise in copper prices to more than $1.00 per pound during the second half of 1987.

CODELCO-Chile, the largest copper producer in the world, continued as the country's dominant copper producer with 77% of total national output, a slight decrease below that of 1986. Privately owned mines, which accounted for the rest of the output, produced 21% more copper than in 1986.

CODELCO-Chile invested $323 million in equipment and installation projects in 1987. The following were the most important expenditures: at the Chuquicamata Div.—increasing ore beneficiation capacity to 153,000 tons per day, leaching of waste dumps, and improvements to electrolytic refinery No. 2 and to the pier and coal-handling system for the Tocopilla powerplant; at the Salvador Div.—expansion of the Chañaral mechanized port facility and El Hueso gold mining project, and modernization of the Potrerillos smelter; at the El Teniente Div.—expansion of smelter capacity; and at the Andina Div.—increasing the retaining wall capacity of the Los Leones tailings disposal dam by 630,000 cubic meters to 35 million cubic meters.

Costs of environmental protection and pollution control amounted to $80 million at the four operating divisions of CODELCO-Chile in 1987. Sulfurous fumes at the Chu-

quicamata smelter were curtailed by converting them into sulfuric acid. The control system was commissioned in 1987 with an initial output of 700 tons per day of sulfuric acid. After expansion of the acid plant in 1988, acid production will increase to 2,400 tons per day.

ENAMI's production of refined copper was more than 200,000 tons in 1987, exceeding 1986 production by 14%. ENAMI also produced 8.6 million ounces of silver, and 274,600 ounces of gold, increases of 37% and 12%, respectively, from 1986 levels. Both metals were recovered from residues of the electrolytic process.

In the small- and medium-scale mining sector, Cía. Minera Disputada de las Condes S.A., a subsidiary of Exxon Minerals Chile Inc., operated two mines, two concentrators and one smelter. El Soldado Mine supplied copper ore to El Cobre concentrator in the coastal area near Santiago, and the Los Bronces Mine supplied the San Francisco concentrator in the Andes Mountains east of Santiago. Part of the company's copper concentrate was smelted at its Chagres smelter to produce about 40,000 tons per year of blister copper and 80,000 tons per year of sulfuric acid. Producing nearly 93,000 tons of copper in 1987, Minera Disputada became the largest private copper company in Chile. The second largest private copper producer was Mantos Blancos Mine, owned by Anglo American and located 45 kilometers from Antofagasta. This company, which produced about 86,000 tons of copper in 1987, has invested $70 million in a major expansion of its mine and added a sulfide ore flotation plant. Oxide copper ore leach capacity is 9,500 tons per day. The cement copper produced is smelted and sold as fire-refined copper; the sulfide ore is processed by conventional crushing and grinding, followed by flotation to produce copper concentrate that was sold to ENAMI. Silver was an important byproduct.

Sociedad Minera Pudahuel S.A. operated two mines, Lo Aguirre near Santiago and Las Cascadas near the port of Iquique. The combined copper production from these mines in 1987 was 30,900 tons.

Cía. Minera Cerro Centinela S.A., owned by the LUKSIC Group, operated the Carolina de Michilla, Cerro Negro, Santa Margarita de Astillas, Combarbalá, and Illapél Mines to produce about 24,000 tons of copper per year and 322,000 ounces of silver plus a minor amount of gold.

Cía. Minera Ojos del Salado, wholly owned by Phelps Dodge Corp. of the United States, expanded its concentrator plant capacity from 14,500 tons per year to 22,000 tons per year of copper concentrate grading 30% copper, 1.6 ounces of silver per ton, and 0.2 troy ounce of gold per ton. All production was sold to ENAMI.

A consortium of foreign investors, led by BHP-Utah Mineral International Inc., was negotiating an agreement with the Chilean Foreign Investment Committee under article 600 of the Chilean Investment Law for the development and exploitation of La Escondida copper mining project. The enterprise would be one of the largest mining project in the world, with an estimated investment of $1.1 billion over a 3-year period. The partners, who will provide about $400 million in capital investment, are as follows: Utah International Inc., wholly owned subsidiary of the Australian firm The Broken Hill Pty. Co. Ltd. (BHP), 60%; Rio Tinto Zinc Corp. PLC (United Kingdom), 30%; and Mitsubishi Corp., Mitsubishi Metal Corp., and Nippon Mining Co., through Japan Escondida Co., 10%. The balance of approximately $680 million will be financed by a group of investors and banks. These include the Export-Import Bank of Japan, $245 million; a group of Japanese commercial banks, $105 million; the Kreditanstalt für Wiederaufbau, $140 million; the Export Development Corp. of Canada, $50 million; Kansallis-Osake-Pankki of Finland, $46 million; the World Bank, $70 million; and an "export finance" group, $24 million. Since 1981, about $90 million has been invested in the project for exploration activities.

Five engineering firms have shown interest in bidding for the engineering and construction of facilities for La Escondida project. Bids were to be opened on April 11, 1988, and the contract awarded by the end of April 1988. The entire project was to be completed within 3 years.

According to the loan agreements, about 90% of total copper production must be available to foreign buyers by the end of 1991. Sales agreements for 6.2 million tons of copper concentrate have been announced. The buyers include seven Japanese smelters who are partners in the mine and will purchase 4.3 million tons of copper concentrate over a 12-year period starting in 1991; and various customers in the Federal Republic of Germany and Finland who are putting up some of the investment capital and will buy 1.9 million tons.

La Escondida, in the Atacama Desert, has one of the largest copper reserves in the world. Economically recoverable reserves are estimated at 675 million tons with an average grade of 2.16% copper. The deposit also has residual gold, silver, and molybdenum.

When the mine is fully developed, La Escondida's output of 320,000 tons per year of copper concentrate would make it the world's third largest copper mine, after Chuquicamata at 520,000 tons per year and El Teniente at 370,000 tons per year. La Escondida is potentially one of the most significant copper projects for the 1990's and is destined to keep Chile as the world's biggest and lowest cost producer of copper well into the next century.

Gold and Silver.—Chile's preliminary figures indicate that gold production decreased by 5% to about 548,000 ounces, primarily because of decreased output from El Indio Mine. Silver output was unchanged at about 16 million ounces in 1987. Gold and silver were produced primarily as byproducts of copper operations.

ENAMI, the state-owned marketing and processing agency for small- and medium-size mines, operated a precious metals refinery at Las Ventanas to recover gold and silver from residues of electrowon copper. ENAMI also purchased gold ore from the small mining sector and processed concentrate from CODELCO-Chile on a toll basis. ENAMI produced 52% of the total gold output of the country, or about 276,000 ounces, an increase of 12% over that of 1986. Gold output from El Indio Mine continued its downward trend since 1985 owing to exhaustion and falling grades. Gold output was 211,000 ounces, down 19%. CODELCO-Chile gold output also decreased slightly.

Exploration for precious metals in Chile continued to intensify owing to the improved gold and silver prices in recent years and to favorable debt-equity swap operations.

On November 2, 1987, St. Joe Gold Corp., a former subsidiary of Fluor Corp., was bought by Dallhold Resources Inc., a subsidiary of the Alan Bond Group of companies in Australia. In addition to El Indio Mine, St. Joe Gold operated El Tambo Mine, 8 kilometers southeast of El Indio. Underground and surface mining had begun in 1985 at El Indio while heap leaching of low-grade gold ores was begun in September 1986 at El Tambo.

The heap-leaching operation at El Tambo Mine had a design capacity of 15,000 tons per month but it actually processed only 10,000 tons per month. Gold recovery was approximately 50% after 60 days and 73% after 150 days. The new Australian owners planned to increase the production capacity of El Indio and Tambo Mines from 62,500 tons of ore per month to 90,000 tons in 1988 and 1989. The recovered gold was sent to El Indio metallurgical plant.

At the Marte gold project in the desert zone of Copiapó south of the Salar de Maricunga, Cominco Resources and Anglo American have invested $30 million in exploration drilling and sampling and built nearly 420 kilometers of access road. With an additional investment of $47 million, the joint venture expected to have the property in production by the end of 1989 at the rate of about 90,000 ounces of gold per year. The estimated reserves were 39.6 million tons of ore grading 0.04 ounce of gold per ton. A surface mining and heap-leaching operation initially would process about 2 million tons per year of ore. The open pit would have a low waste-to-ore stripping ratio.

Gold Fields Mining Inc., a wholly owned subsidiary of Consolidated Gold Fields PLC, sold its Coipa silver-gold deposit in Chile for $30 million and future royalty entitlement. The buyer was Cía. National de Mineria Ltda. (CNM), a Chilean company. Consolidated TVX Mining Inc., a Canadian private company with interests in Brazil, was to acquire a 49% interest in CNM.

Only 6 kilometers south of Marte, Anglo American was drilling in El Lobo, a deposit that had an estimated 30 million tons of ore grading 0.04 ounce of gold per ton. This property also could be in operation by 1990 or 1991.

El Hueso was another project near El Salar de Maricunga that has been explored by El Salvador Div. of CODELCO-Chile. Reportedly, more than $20 million had been invested in development and metallurgical testing. The ore body was amenable to surface mining and heap leaching. Reserves were estimated at 16 million tons of ore grading 0.05 ounce of gold per ton and 22.5 ounce of silver per ton. Homestake Mining Co. of the United States bought the property for $50.4 million despite labor union opposition to its privatization.

Construction was scheduled to begin in October at the new Choquelimpie silver-gold mining project in northern Chile. The project was a joint venture of Westfield Minerals, Shell Chile S.A., and Citibank

N.A. The deposit is 15,200 feet above sea level in the Parinacota District, close to the Bolivian border, and is accessible by road from Arica. Development and operation of the mine will be by a Cía. Minera Altiplano, a separate company created by the partners. Measured reserves include both oxide and sulfide ores, estimated at 12 million tons grading 0.07 ounce of gold per ton and 1.9 ounce of silver per ton. Estimated production would be 50,000 ounces of gold in the first year of operation, rising to 100,000 ounces in the third year. Full-scale operation was expected to begin in mid-1988 with a mine life of up to 10 years.

The value of silver exports increased 18% to $80 million owing chiefly to increased silver prices during the year. Of the total of 16 million ounces, ENAMI produced 8.6 million ounces of silver at its Las Ventanas precious metals refinery, from concentrate purchased from small- and medium-size mines. The most important silver mines were Caracoles, Cachinal de la Sierra, El Bronce, and Vaquillas. CODELCO-Chile produced 7.1 million ounces of silver, or about 44% of the nation's total. CODELCO-Chile recovered silver from anode slimes at the Chuquicamata and El Salvador copper refineries.

Iron Ore.—Production of iron ore decreased 4.6% to gross weight of 6.7 million tons. Cía. Min del Pacífico S.A. (CMP) operated iron mines in the northern part of the country. The operation was oriented basically toward exports; overseas shipments accounted for about 84% of the total sales in 1987. CMP's production capacity was 7.5 million tons per year of products comprising sinterfines, lump ore, and pellets. In 1987, the company made some adjustments in its operations in order to accommodate the volume and quality requirements of the international market. CMP produced 6 million tons in 1987, of which 60% was iron ore pellets. Iron ore and pellets were exported mostly to Japan followed by the United States, the Federal Republic of Germany, and Argentina. The value of iron ore and pellets exported increased 9% to $96 million. CMP's domestic shipments of about 1 million tons were destined for the Huachipato steel plant near Conception. CMP obtained a net profit of $464,000 in 1987 compared to a loss of $4.5 million in 1986. CMP's iron ore mines had about 350 million tons of reserves.

Iron and Steel.—The recently privatized holding company, Cía. Aceros del Pacífico S.A. (CAP), produced pig iron, crude steel, and ferroalloys at about the same levels as in 1986, while its output of semimanufactured (controlled) products increased by 13%. Cía. Siderúrgica de Huachipato S.A. (CSH), a subsidiary of CAP, earned $26 million in 1987, up 52%, the largest profit ever made by CSH in its history. Almost 82% of total production was consumed domestically, and the balance was exported to Ecuador and Costa Rica.

In December 1986, CORFO sold 3% of its shares of CAP to CAP employees, with the result that the private sector held 52% and the workers held 24% of the total capital. Subsequently, CORFO sold to the private sector the remainder of its CAP shares.

In September, CORFO signed an agreement with the consortium Mitsubishi-Nippon Kokan K.K. for the construction of a new 500,000-ton-per-year coke plant that would be financed entirely with foreign credit. The investment required was estimated at $110 million and the plant was expected to be operational in the next 3-1/2 years.

Lead and Zinc.—Chile was a minor producer of lead and zinc ores. In 1987, the output of lead declined by 45% while the production of zinc rose 87%. Of three producers of these commodities in Chile, the most important one was Sociedad Contractural Minera El Toqui Ltda. All of them were in Aysén Province, southern Chile. The other two lead and zinc producers were Cía. Minera Catemo Ltda. and Empresa Minera de Aysén Ltda., owned by CORFO. Minera Catemo operated a 700-ton-per-day floatation concentrator, producing about 2,000 tons per year of lead concentrate and 9,000 tons per year of zinc concentrate.

Minera El Toqui, initiated in 1984, resumed operation in 1987 after being shut down for most of 1986 owing to falling lead and zinc prices and heavy debt servicing costs of about $30 million. The company's debt was restructured, and the mine reopened in October. The Government provided the firm with assistance because it was one of few employers in this remote southern area. Nonetheless, the firm was forced to reduce the labor force by one-half in November, Lac Minerals Ltd. of Canada paid $19 million for 85% control of the company through a debt-equity swap. Minera El Toqui was treating 650 tons per day of lead and zinc ores from the San Antonio zinc mine and was planning to increase production to 1,100 tons of ore per day. Lac

Minerals will invest an additional $6 million during the next 3 years in exploration and development of the Katerfeld II polymetallic vein. The deposit has at least 100,000 tons of ore grading 0.96 ounce of gold per ton.

Molybdenum.—CODELCO-Chile was the second largest producer of molybdenum in the world and the only producer in Chile. Copper deposits in Chile contain 25% of the world's known molybdenum reserves and 37% of the known rhenium reserves. In 1987, CODELCO-Chile produced almost 17,000 tons of molybdenum in concentrates. Of this amount, 6,202 tons was converted into molybdenum trioxide in Chuquicamata and the rest was sent to Molymet in Santiago for processing into molybdenum trioxide, ferromolybdenum alloy, and ammonium perrhenate.

On December 23, the U.S. Government removed molybdenum ores and oxides from duty-free eligibility under the GSP. This action followed a petition by domestic producers of molybdenum ore and oxide. As a consequence, the duty to be applied to Chile was that of the most-favored-nation tariff rate: 9 cents per pound on the molybdenum content and 6 cents per pound on the molybdenum content of the oxides, plus 1.9% ad valorem.

The new tariff went into effect for all beneficiary developing countries 2 days after the appearance of the Government's proclamation. The U.S. Government decision was based on the troubled condition of the domestic industry and the administration's longstanding policy that GSP's are temporary and should be removed when beneficiaries no longer need the preferences to gain access to the U.S. market.

Rhenium.—Molymet was the sole producer of ammonium perrhenate in Chile. It was recovered by a solvent extraction process from gases produced from the roasting of molybdenum concentrate. Production of rhenium in 1987 decreased 22% to 14,471 pounds. The ammonium perrhenate price increased 52% to $393 per kilogram.

INDUSTRIAL MINERALS

Lithium and Potassium.—Sociedad Chilena de Litio Ltda., jointly owned by Foote Mineral Co. (55%) of the United States and CORFO (45%), produced almost 6,200 tons of lithium carbonate in 1987, an increase of 38%. The production plant, with a capacity of about 14 million pounds per year of lithium carbonate, came on-stream in the second half of 1984 at capital cost of $56 million.

Sociedad Minera Salar de Atacama Ltda. (MINSAL), a consortium of AMAX, 63.75%; CORFO, 25%; and Molymet, 11.25%, had a contract with the Chilean Government to produce potassium chloride, 500,000 tons per year; potassium sulfate, 250,000 tons per year; boric acid 30,000 tons per year, and lithium metal. The area assigned to MINSAL in the Salar de Atacama has estimated reserves of 47 million tons of potassium chloride, 21.2 million tons of potassium sulfate, 4 million tons of boric acid, and 1.67 million tons of lithium metal.

A separate agreement with CORFO allows MINSAL to start producing 2,800 tons per year of lithium metal (6% of the feed), increasing by 7% per year, thereafter, up to a maximum of 13,700 tons per year of lithium. The initial capital invested was $6 million.

Nitrates and Iodine.—The Chilean Chemical and Mining Co. (SOQUIMICH), the largest producer and exporter of natural nitrate products and iodine, inaugurated a new iodine-recovery facility in response to the growing demand in the United States and Europe for natural nitrate, industrial sodium, sodium sulfate, iodine, and iodic salts. SOQUIMICH, sole producer from nitrate deposits in the Atacama Desert in northern Chile, was a Government-owned entity that was being privatized.

The new $1.8 million facility was to produce 150 tons of iodine per year with a market value of $2.5 million. The plant was in the arid Tamarugal Plains, 123 kilometers northeast of Antofagasta and would leach the tailings at SOQUIMICH's old Puelma nitrate operation. The modular plant would be transported to another site as soon as the resources at Puelma are depleted, probably in the next 5 years. The final product of this plant is a concentrate from which pure iodine is recovered at the Maria Elena and Pedro de Valdivia plants. In 1987, iodine shipped from Chile was marginally higher at 3,100 tons, but sales revenues increased considerably because of a 24% price increase to $15,928 per ton. SOQUIMICH was planning to construct a $90 million plant, close to either the Soronal or Piscis ore bodies in Region I, near the port of Iquique. It would produce 300,000 tons per year of nitrate and 1,100 tons of iodine. Ore reserves were estimated at 200 million tons of caliche (the material from which sodium nitrate, potassium nitrate,

and iodine are extracted) containing 8.6% nitrate, with a productive life to 10 years. The plant would incorporate new technology developed by SOQUIMICH from its own research. It would employ 300 workers directly and was expected to create 3,000 indirect jobs.

According to SOQUIMICH officials, the nitrate industry was experiencing an unprecedented turnaround as a result of rising international demand by agricultural, industrial, medical, and chemical industries. Chile produced and exported 35% of the iodine consumed in the world's market. Buyers for this product included China and the Soviet Union. The U.S. Department of Commerce has imposed preliminary duties of 33.4% on imports of industrial-grade sodium nitrate from Chile. SOQUIMICH was expected to appeal the ruling, which was based on charges that the company was dumping the chemical on the U.S. market.

MINERAL FUELS

Coal.—Coal production in Chile has grown steadily but was inadequate to satisfy domestic demand. The country imported 500,000 tons of metallurgical coal and 60,000 tons of coke from Australia, Canada, and the United States in 1987.

COCAR brought into production Chile's first large-scale surface coal mine at Pecket Island, Region XII, Magellan Province in southern Chile. The $75 million project includes a subbituminous steam coal mine with an output of 1.1 million tons per year. It also will have a 1.8-kilometer bulk-loading marine terminal with water depth sufficient to receive 60,000-ton vessels. The loading terminal will be one of the largest in Chile.

The Pecket coal project was expected to save Chile about $40 million in energy costs and an additional $100 million in oil imports, or about 25% of the country's oil-import costs. Pecket coal will fill the electricity needs of Region I and II in northern Chile. COCAR contracted to supply CODELCO-Chile with 880,000 tons of steam coal per year for 10 years beginning in 1987.

Coal reserves in the Pecket area were estimated at 50 million tons of proven and indicated reserves. Coal could be extracted by surface and underground mining.

COCAR was formed in 1981 by Cía. de Petróleos de Chile S.A. and Northern Strip Mining Ltd. of the United Kingdom, with 10% equity participation by the World Bank.

Cía. Carbonífera Schwager Ltda., wholly owned by Empresa Nacional del Carbón S.A. (ENACAR), itself a subsidiary of CORFO, was being privatized with 42.4% of its shares sold by yearend. The coal deposits belonging to Schwager contained probable reserves of about 12.4 million tons with a life of 35 years at current production levels. For 1988, the output was forecast at 350,000 tons.

According to estimates of the National Energy Commission, domestic demand for coal may double over the next 10 years, from 1.97 million tons to 3.78 million tons per year.

Natural Gas.—Output of natural gas declined slightly in 1987 to about 154 billion cubic feet, continuing a decline that began in 1982. From the total production 69.4% was reinjected, 4.3% was flared, and 26.3% was marketed domestically.

A plant for the production of 2,270 tons per day of chemical-grade methanol was under construction at Cabo Negro, 30 kilometers north of the city of Punta Arenas, in the Strait of Magellan. Production was to be mainly for export. Gas consumption would be 78 million cubic feet per day and would be delivered by Empresa Nacional del Petróleo (ENAP) at Cabo Negro. The plant was being built and was to be operated by Cape Horn Methanol Ltd. ENAP had a 20-year contract to supply the gas. Cape Horn Methanol's investment was about $295 million. Production was expected to start in mid-1988.

A fertilizer project was under preparation at Punta Purpesse in the Cabo Negro area, close to the ENAP and methanol plants. The proposed plant would supply 350 tons per day of ammonia and 1,725 tons per day of urea. Production was to be sold to domestic and overseas markets. ENAP was to supply 57 million cubic feet of gas per day over a 20-year period. Total investment, including financial costs, was estimated at $360 million. Combustion Engineering Inc., a U.S. firm, was to manage the project. A 185-kilometer gas pipeline of 18-inch diameter would be constructed by ENAP between its Posesion plant and Cabo Negro to supply the gas required by the methanol and fertilizer projects. The design pressure is 1,500 pounds per square inch, and in its initial stage the gas would be delivered without the need of intermediate compression stations. The pipelines also would deliver gas to the city of Punta Arenas. The additional investment, about $20 million, would be

partially financed by loans from the Inter-American Development Bank.

By yearend 1986, the purchase of pipe and coating material had been completed and the construction bid had been evaluated. Construction was scheduled to begin in early 1987, and pipeline operation would start 12 months later.

Petroleum.—Chilean crude petroleum output decreased by almost 11% to 10.9 million barrels in 1987. This output level was below the 1982 record peak of 15.6 million barrels.

Chile's sole producer of crude, ENAP, supplied only 40% of Chile's domestic demand, compared with the 59% share in 1982. Offshore production during 1987 amounted to 65% of total production. There were 32 platforms in operation in 7 oilfields. Declining production from existing oilfields in the Strait of Magellan area has forced ENAP to explore in other zones of the country including the areas of Paine, Natalies, Isla Riesco, Península de Brunswick and south of Tierra del Fuego areas in Region XII. Although earlier reports of oil discoveries in the Salar de Atacama proved untrue, they were based on the preliminary results of seismic work under way at that time. According to ENAP officials, the results of the detailed seismic program were so promising that the signing of participation agreements was postponed until the program was completed. Private consultants familiar with the detailed seismic data considered it extremely encouraging. Accordingly, Hunt Oil Co. of the United States signed an agreement with ENAP for joint exploration of northern Chile.

ENAP was involved in a number of external arrangements to develop oil reserves outside Chile. In April, ENAP signed an agreement with Petro Canada to jointly explore for oil in Ecuador. ENAP was negotiating with Yacimientos Petroliferous Fiscales of Argentina and Petróleo Brasileiro S.A. (PETROBRÁS) of Brazil to form a consortium to develop oil in Argentina's offshore areas.

ENAP was also negotiating the construction of offshore oil platforms for a French consortium that was exploring for oil in Argentine waters off the eastern coast of Tierra del Fuego.

ENAP planned to send a number of geologists to the Antarctic in January or February 1988 to explore for petroleum deposits on that continent. Of particular interest to ENAP were a number of islands near the Antarctic Peninsula, which have sediments the same age as those found in the Strait of Magellan.

ENAP's motive for all of the above negotiations was to diversify its activities away from its current concentration in Region XII and obtain access to additional petroleum resources.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Chilean pesos (Ch$) to U.S. dollars at the average rate of Ch$220 = US$1.00 for 1987.

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